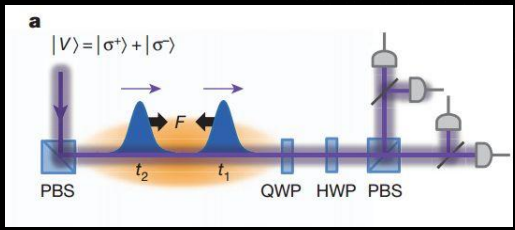
Molecular Photons

Discovery!

Mikhael Lukin from Harvard University and Vladan Vuletic at M.I.T were successful in creating a molecule of Photons. This was accomplished through the use of an ultracoold atomic gas (Rubidium) and a thin stream of 479 nm laser light. When the first photon of light passes through the ultracold Rubidium it caused the gas to form a Rydberg state. Then the second photon follows in quick succession and because the region of the Rydberg state has a different index of refraction it stays close to the first photon and therefore both photons travel together through the gas. The result of this is a bound state of two photons, or in other words, the photons will emerge at the same time from the gaseous medium. Furthermore, through the measuring of polarization of the light molecules after exiting the medium it was shown that the molecular photons had also become entangled. This was tested by firing specifically polarized photons into the ultra cold gas and then measuring their polarization after exiting the gas.

Use:

These molecular photons are of interest because they could be of use to increase the speed and energy efficiency of computers by allowing them to work on light pulses instead of electrical pulses. This technology is still a while away because it is still necessary to convert light pulses to electrical pulses for processing and then back to light pulses. However since it has been shown that photons can now interact (through the formation of molecules) it may be possible to form all-optical logic gates to process information. The other possible use is to help with the continual development in quantum computing. Since Photons are good at transmitting quantum bits of information over long distances but it is very rare for them to interact their use (either as molecules or as single particles) in quantum computing and the creation of an all-optical logic gate is still not yet fully known.



A schematic of the forces present between the molecular photons.